

## Learning style preferences: A study in primary education

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### ABSTRACT:

This paper presents the research that was conducted at primary school students, aged 11 years, in Greece. Based on Fleming's VAK Learning Style Model, we design two educational scenarios regarding the Acropolis of Athens at the educational platform "Moodle", one for students with visual learning style preference and another with auditory one. The objective of this study is to investigate the differences among students with visual, auditory and intermediate learning preferences when they receive matched and mismatched educational material over academic performance, participation, motivation and satisfaction. Specifically, we customize the content and its layout to the learner's learning preference. The results of the experiment show that the users who studied the educational scenario for the visual learning style preference recorded better academic performance and higher levels of satisfaction than the students who studied the educational scenario for the auditory learning style preference. As for participation and motivation, there are no significant differences among students.

**Key words:** visual, auditory, learning preferences, primary education

### INTRODUCTION

Several learners' characteristics are cited as factors that affect the effectiveness and efficiency of learning and learning design, such as education, experience, levels of numeracy and literacy, motivation, self-perception, learning styles, etc. [1]; individual differences [2]; background, age, previous knowledge, education level [1]; working memory capacity, personality traits [3]; interest level, abilities and learning styles [4]. Among the personal characteristics, learning styles represent the mode of perception and processing of information and have been recognized as an impact factor that is associated with the display of educational material at computer-based learning environments.

There are several definitions for the term "learning styles". The most well-known definition is [5] who defines them as "*characteristic cognitive, affective and psychological behaviours that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment*"; [6](7) defined them "*as the complex method in which learners most efficiently and most effectively perceive, process, store and recall what they are trying to learn*". [7] claim that is the preferable way of organization and presentation of information; [8] support that is the way of perception, processing, storing and recalling learning efforts; [9] describe them as the preferable style that is obvious mostly when individuals interact and is the optimal way in which they communicate. Most definitions converge that learning styles are the way of approaching and processing new learning situations or information [10]; [11].

The present work takes into account the factor "learning style" for content's and presentation's customization at learners' learning style preferences. We utilize the VAK Learning Style Model because is handy and suitable for students and also, due to its high degree of reliability, validity and inclusiveness [12].

### OBJECTIVE AND RESEARCH QUESTIONS

The purpose of this study is to investigate the differences among students with visual, auditory and intermediate learning style preference, receiving matched and mismatched educational scenarios, over academic performance, participation, motivation and satisfaction. The present research is based on mixed research method, as combines qualitative and quantitative methods for data collection, achieving in this way triangulation. Notwithstanding, we follow qualitative method of data analysis due to small sample size. In particular, the research questions are the following: how much is the difference between auditory learners who receive visual educational scenario and auditory learners who receive auditory scenario over academic performance, participation, motivation and satisfaction? how much is the difference between visual learners who receive auditory educational scenario and visual learners who receive visual scenario over academic performance, participation, motivation and satisfaction? how much is the difference between intermediate learners who receive auditory educational scenario and intermediate learners who

receive visual scenario over academic performance, participation, motivation and satisfaction?

## METHODOLOGY

### 1. Participants

The sample consisted of 16 students, aged 11 years from 2<sup>nd</sup> Primary School of Nea Ionia at Volos in Greece. The sample was selected with the method of convenience sampling, as we had access only in one classroom [13].

### 2. Data collection and analysis

Regarding the data collection, we utilize several instruments. We employed the VAK questionnaire which identifies the learners' learning style preferences. We used the pre-post testing methods. The participants submitted the same test before and after the educational intervention, which included five questions in order to find any differentiation over academic performance. Pre- and post- testing is an ideal technique for systems that simulate the instructor's role [14]. We extract information from log files about time that the learners dedicated to study the educational material, return times for study, time for activity completion and resubmission times for activity completion, in order to explore the learners' participation. We used systematic observation in order to explore the degree of participation through the frequency of certain verbal and non-verbal behaviours and interactions. The observation follows the time sampling method and observations were recorded every ten minutes. We used also self-administered, open and close ended questionnaires due to limited timetable in order to explore the degree of satisfaction. The open ended questionnaire was choosed as substitute to interviews because interviews were not allowed. The close ended questionnaire included questions that learners expressed the degree of agreement or disagreement in five point scale. In conclusion, we collect data through qualitative and quantitative methods in order to reinforce the reliability and validity of results. Notwithstanding, we cannot overlook the fact that the sample is inadequate and therefore, we cannot generalize the results. Due to small sample size, we decided to analyze the data through qualitative analysis of data [15].

### 3. Design and procedure

The students complete the VAK questionnaire for identification of learning style preferences two weeks before the educational intervention.

However, we did not administer the authentic questionnaire, as we restrict the questions from 30 to 20 because this questionnaire addresses the adults. The results show that approximately 44 percent of students prefer the visual learning style, 33 percent prefer the auditory and 25 percent of students are intermediate, as they did not appear clear preference. From 16 students, 7 students were visual, 4 auditory and 5 intermediate. Half of them received mismatched educational scenario.

The educational intervention lasted seven sessions and the researcher was restricted to support students in technical issues. The participants used computers in order to complete the educational scenarios. At the first session, students were administered with pre-test, in order to indentify the level of knowldge according to the monuments of the Acropolis of Athens. From second to fifth session, the students attended the scenario about the Acropolis in Moodle and during the last session, they complete the post-test and the two questionnaires.

### 4. Ethics and Deontology

We adhere to ethical principles of scientific research. Specifically, we respect the intellectual property of authors, avoiding plagiarism. The data of research were not distorted, as we abide by integrity, honesty and objectivity required for scientific research. We analyzed and interpreted the data, avoiding as soon as possible bias and prejudices, respecting objectivity. As for the conduct of the research, we explained the purpose of research in order to protect the human subjects, respecting their autonomy and privacy. Finally, we avoid discrimination against learners, as we behaved them fairly and equally [16; 17].

## RESULTS

As for pro-test results, we did not observe difference among learners over academic performance. As far as post-test results are concerned, visual and intermediate learners who attended educational scenario for visual learning style preference recorded higher academic achievement than auditory who attended scenario for visual preference, as we can see at Fig 1.

It is remarkable that auditory learners who attended scenario for auditory learning style preference recorded higher academic achievement than those who attended scenario for visual preference.

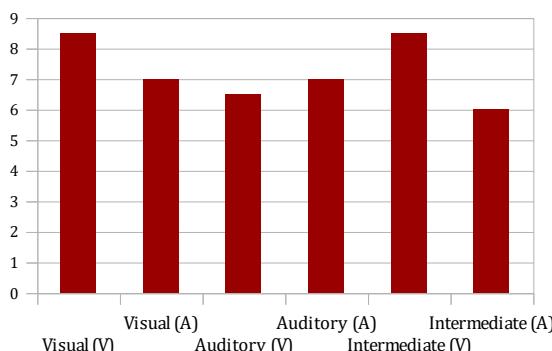


Fig. 1. Results about academic performance

Fig 1 shows the results about academic performance. Regarding results about activity completion, we can observe that visual and intermediate learners who attended educational scenario for visual learning style preference recorded higher level of inclusiveness in activity completion than auditory learners who attended the same scenario [Fig 2]. We observe that auditory learners who attended scenario for auditory learning style preference

recorded higher level of inclusiveness in activity completion than those who attended scenario for visual preference. These findings come into agreement with academic achievement and we can conclude that for auditory learners the type of educational scenario has more significant value than intermediate and visual learners, as they recorded higher levels over academic performance and activity completion.

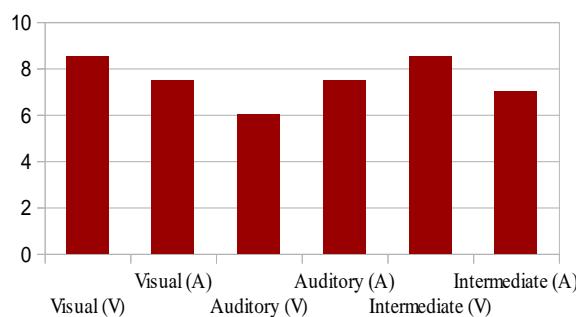


Fig. 2. Results about academic performance

Fig 2 shows the results about academic performance. As regards the log files, we can observe that learners who attended educational scenario for visual learning style preference dedicated more time to

study and complete the activities than those who attended scenario for auditory preference, as we can see at Fig 3.

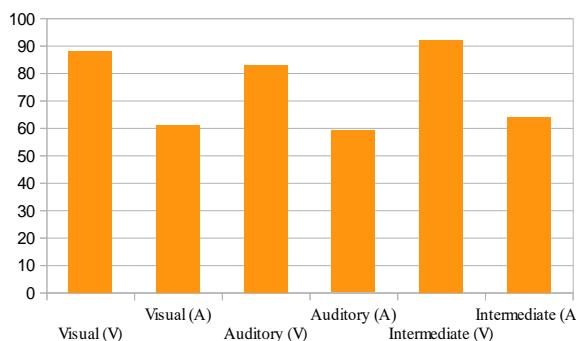


Fig. 3. Results about participation

Fig 3 shows the results about participation

As far as return times and resubmission times are concerned, we can observe that there are no differences in resubmission times for activities among learners [Fig 4].

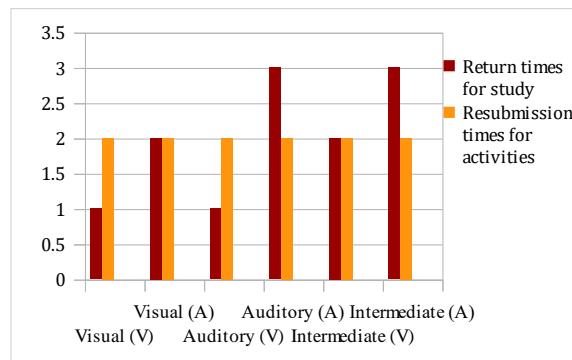


Fig. 4. Results about participation

Fig 4 shows the results about participation. As for the results about close ended questionnaire, learners who studied educational scenario for visual learning style preference recorded high levels of satisfaction, as the layout "pictures-text" helped them in better understanding of content and activity

completion, while learners who studied the scenario for auditory learning style preference recorded lowest levels of satisfaction, as the narration helped them in lower degree. All learners stated that they were willing to attend a similar scenario in the future, as we can see at Fig 5.

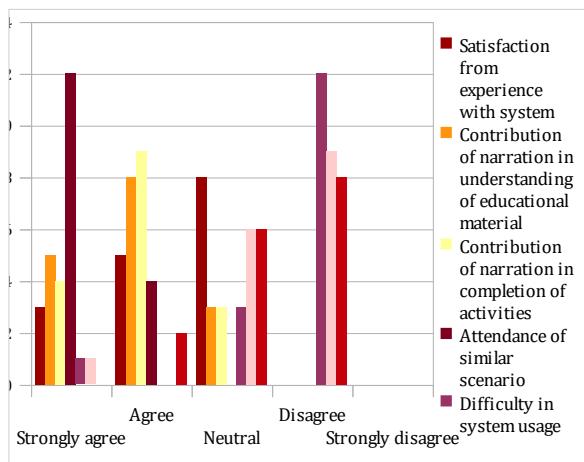


Fig. 5. Results about satisfaction

Fig 5 shows the results about satisfaction. As far as the results about the open ended questionnaire, learners who studied educational scenario for visual learning style preference stated that pictures, videos, the computer-based study and activities were useful and attractive. Also, they find it entertaining, interesting and well-organized. As far as the results about systematic observation are concerned, visual and intermediate learners who studied scenario for auditory learning style

preference ask for help from their classmates and researcher over content's understanding and activity completion more times than those who studied scenario for visual preference. There are not recorded significant differences among learners over navigation, but a slight difference is observed at learners who studied the scenario for auditory preference. Generally, learners interact with the system at satisfying level [Fig 6].

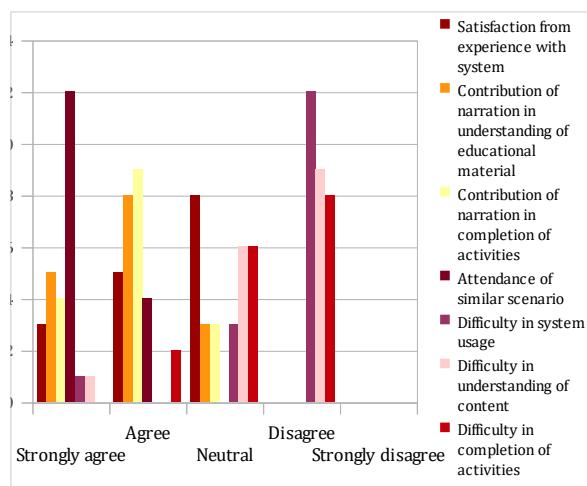


Fig. 6. Results about satisfaction

Fig 6 shows the results about satisfaction

## DISCUSSION

The results indicate that the educational scenario for visual learning style preference is more desirable and helpful for learners with visual and intermediate learning style preference in terms of academic performance, but the scenario for auditory preference is more suitable for learners with the same preference than visual ones. Regarding participation, we found that there were not significant differences among learners. As far as the motivation is concerned, learners from all three groups stated that video, computer-based study and activities are incentives. Therefore, the levels of satisfaction are high. Specifically, learners who studied scenario for visual learning style preference stated that were more satisfied than those who studied the scenario for auditory one.

## CONCLUSION

The current research approaches the learning styles as a source of content's and presentation's adaptation to learners preferences. The findings of this study are of significant importance for teachers who are interested in incorporation of learning styles into their instruction. Specifically, learning styles come into agreement with the principles of differentiated instruction. Apart from teachers,

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researchers and educationalists gain an insight into pedagogy and can extend this knowledge to other subjects and other grades of education. Also, they can utilize varied learning styles models and conclude what is the most appropriate for primary school students. As far as the limitations of the study are concerned, the small size of participants cannot be considered representative and therefore, the results cannot be generalized. In addition to this, the duration of the research was not sufficient to conclude safe results. Further studies should be conducted in order to assert that the visual educational material is effective for primary education students.

## ACKNOWLEDGEMENTS

This paper is part of Master Thesis that was elaborated at the University of Thessaly.

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